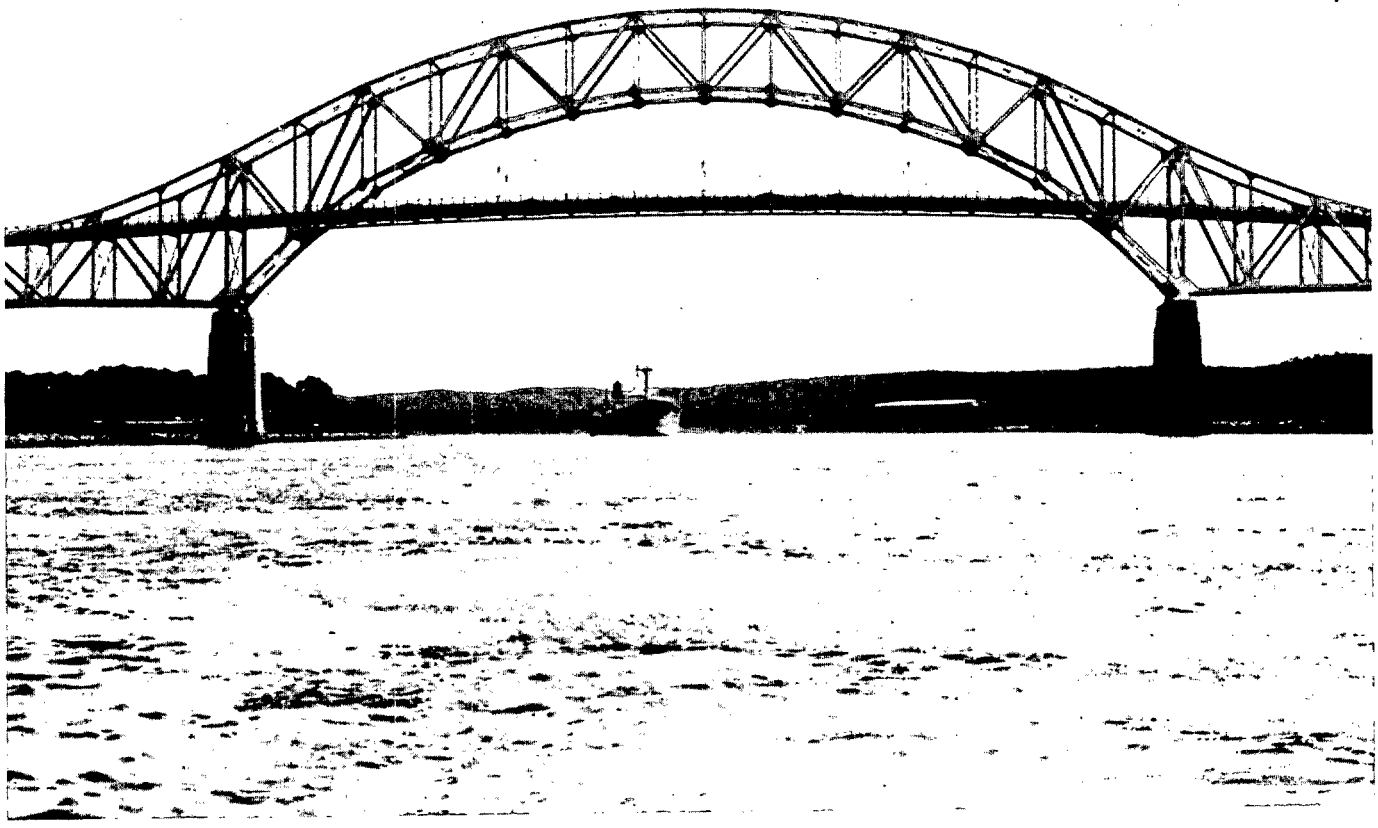
CAPE COD CANAL
BOURNE & SANDWICH, MASSACHUSETTS



DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

SUPPLEMENT NO. 1
MAJOR REHABILITATION OF THE BOURNE AND SAGAMORE HIGHWAY BRIDGES

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MA.
02154

MARCH 1979

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ON
OPERATION AND MAINTENANCE
OF THE
CAPE COD CANAL

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BOURNE AND SAGAMORE HIGHWAY BRIDGES

MARCH 1979

New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

SUMMARY

Operation and Maintenance of the Cape Cod Canal
Supplement No. 1
Major Rehabilitation of the Bourne and Sagamore
Highway Bridges

(X) Draft ( ) Final Environmental Statement

Responsible Office: U. S. Army Engineer Division, New England, Waltham, Mass.

1. Name of Action: (X) Administrative ( ) Legislative

2. Description of Action: The project provides for major rehabilitation of the Bourne and Sagamore highway bridges crossing the Cape Cod Canal. The work is expected to be accomplished over a period of four years, beginning in the summer of 1979 and ending in the spring of 1983. The Bourne Bridge will be rehabilitated first, followed by the Sagamore. The major item of work will be replacement of the concrete decks which form the roadways for the bridges. Other work will consist of repairs to structural steel and repainting of both of the superstructures. Also, 8-foot high suicide-deterring barriers will be erected atop the railings on the bridges to discourage suicide attempts.

3. a. Positive Environmental Impacts: The project will ensure the continued safe use of the bridges into the future and eliminate the adverse impacts associated with frequent repair work. The suicide-deterring barriers should help reduce the incidence of suicides from the bridges.

3. b. Adverse Environmental Impacts: Most adverse impacts concern vehicular traffic, specifically the effects on traffic flow when either the Bourne or the Sagamore Bridge is being rehabilitated. To mitigate these impacts, the peak travel period from just before Memorial Day Weekend to just after Labor Day will be excluded from the traffic-restricting construction schedule. During the rest of each year, one of the four traffic lanes would remain open on the bridge being worked on, and all four lanes of the other bridge would be completely open. The one open lane on the bridge under construction would be reversed on weekdays to handle the morning and afternoon directional peaks in traffic flows, with a similar plan to be implemented on weekends. Arrangements would be made to clear this lane of traffic to allow passage of emergency and other authorized vehicles. Trucks in excess of one-ton capacity would be excluded from the single open lane at all times and detoured to the

fully open bridge. Pedestrians and bicycles would also be excluded from the bridge under construction.

Some economic hardship may be borne by frequent or regular users of the bridges as a result of the traffic impacts. During construction, old and new paint and sand from sandblasting falling from the bridges will cause local nuisance effects to land areas beneath them and to vessel traffic in the canal. Noise pollution due to the construction work itself, plus some addition to the local traffic load as a result of the transport of materials and workers to and from the construction sites may also be anticipated.

4. Alternatives:

   a. No action.
   b. Implementation alternatives explored concern the exact extent of the rehabilitations, selection of materials, establishment of time schedules and mitigation of traffic problems.

5. Comments Requested:

   a. Federal

      Advisory Council on Historic Preservation
      Department of Commerce
      Department of Energy
      Department of Health, Education and Welfare
      Department of Housing and Urban Development
      Department of Interior
      Environmental Protection Agency
      Federal Highway Administration
      U.S. Coast Guard

   b. State

      Adjutant General's Office
      Department of Commerce and Development
      Department of Public Health
      Department of Public Safety
      Department of Public Utilities
      Department of Public Works
      Governor of the Commonwealth of Massachusetts
      Massachusetts Historical Commission
      Massachusetts Port Authority
      Office of Environmental Affairs
      Secretary of Transportation and Construction

State Archaeologist
State Clearinghouse, Office of State Planning

c. Regional

Cape Cod Planning and Economic Development Commission
Martha's Vineyard Commission
Nantucket Regional Planning Commission
SE Massachusetts Health Planning and Development, Inc.
Southeastern Massachusetts Regional Planning District

d. Local

Barnstable County Commissioners
Cape Cod Chamber of Commerce
Chairman, Board of Selectmen of each town on Cape Cod plus nearby towns on the mainland
Chamber of Commerce of each town on Cape Cod plus nearby towns on the mainland
Martha's Vineyard Chamber of Commerce
Nantucket Chamber of Commerce

e. Organizations

American Automobile Association
ALA Auto and Travel Club
American Youth Hostels
Massachusetts Audubon Society
National Coalition for Marine Conservation
Sierra Club
The Samaritans

f. Commercial

Almeida Bus Lines
Baxter Transport, Inc.
Bonanza Bus Lines, Inc.
Cape Cod Gas Co.
Cape Cod Ready Mix
Hy-Line
National Railroad Passenger Corporation
New England Tel. and Tel.
Packaging Industries
Plymouth and Brockton St. Railway
Roadway Express, Inc.
Woods Hole, Martha's Vineyard and Nantucket Steamship Authority

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1.00 PROJECT DESCRIPTION

1.01 Introduction.

The objective of the proposed project is to conduct major rehabilitation of the Bourne and Sagamore highway bridges crossing the Cape Cod Canal. The work is expected to be accomplished over a period of four years, beginning in the summer of 1979 and ending in the spring of 1983. The Bourne Bridge will be rehabilitated first, followed by the Sagamore.

1.02 The purpose of this document is to present the environmental consequences of the proposed action, assess reasonable alternatives and effect public involvement to help minimize the impact of the work as much as possible. It has been prepared as a Supplement to the Final Environmental Statement concerning "Operation and Maintenance of the Cape Cod Canal", issued by the New England Division, Corps of Engineers in April 1977. The reader is referred to that document for more detailed information concerning the canal and its features.

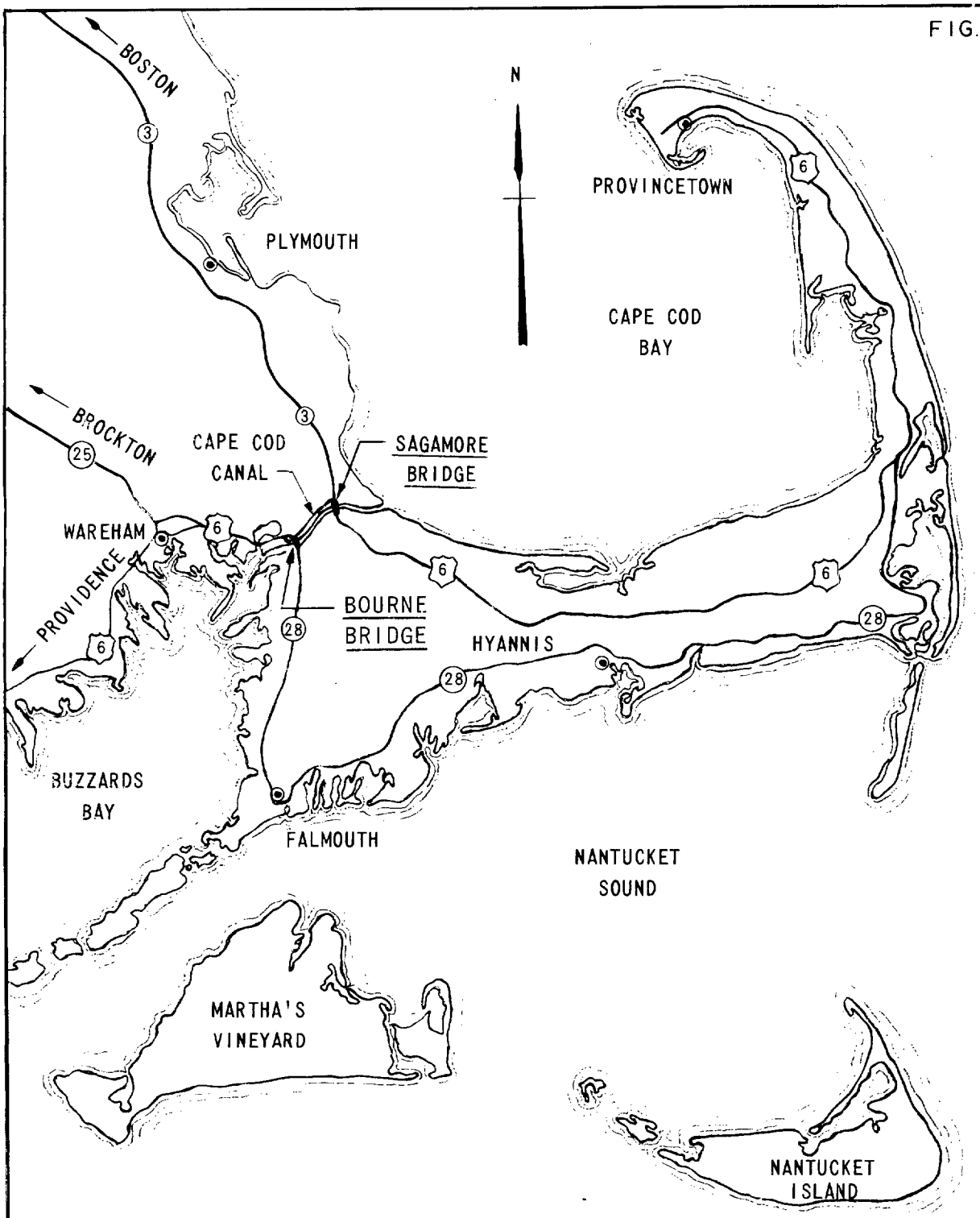
1.03 To help in the discussions that follow, Figure 1 is a map showing Cape Cod, the bridges and the surrounding areas and roads. Figure 2 is a more detailed map of the immediate vicinity of the canal and the bridges. Table 1 is a presentation of facts concerning the bridges themselves.

1.04 The Cape Cod Canal.

The Cape Cod Canal is a sea level canal, located about 50 miles south of Boston, Massachusetts at what was formerly a narrow neck of land joining Cape Cod to the mainland. The canal extends from Cape Cod Bay on the east to Buzzards Bay on the west. Cape Cod became an island with the construction of the canal. Communities adjacent to the canal are Bourne and Sandwich. Highways 6 and 28 and a single track rail line cross the canal on three separate bridges.

1.05 Construction of the original Cape Cod Canal was attempted by the Cape Cod Canal Company in 1880. The cost of dredging and excavation proved so great that the project was abandoned. In 1899, the Commonwealth of Massachusetts granted a charter for construction of a canal to the Boston, Cape Cod and New York Canal Company, headed by August Belmont, a New York financier. The cost of construction was estimated at $12,000,000 and the charter specified a minimum depth of 25 feet at mean low water and minimum width of 100 feet. Work began in 1909 and the State accepted the project as completed in accordance with the charter in 1918. The total cost of $16,131,000 included canal

FIG. 1



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

CAPE COD CANAL
BOURNE, MASS.

CAPE COD CANAL BRIDGES
MAJOR REHABILITATION PROJECT

MAP OF CAPE COD
AND SURROUNDING AREAS

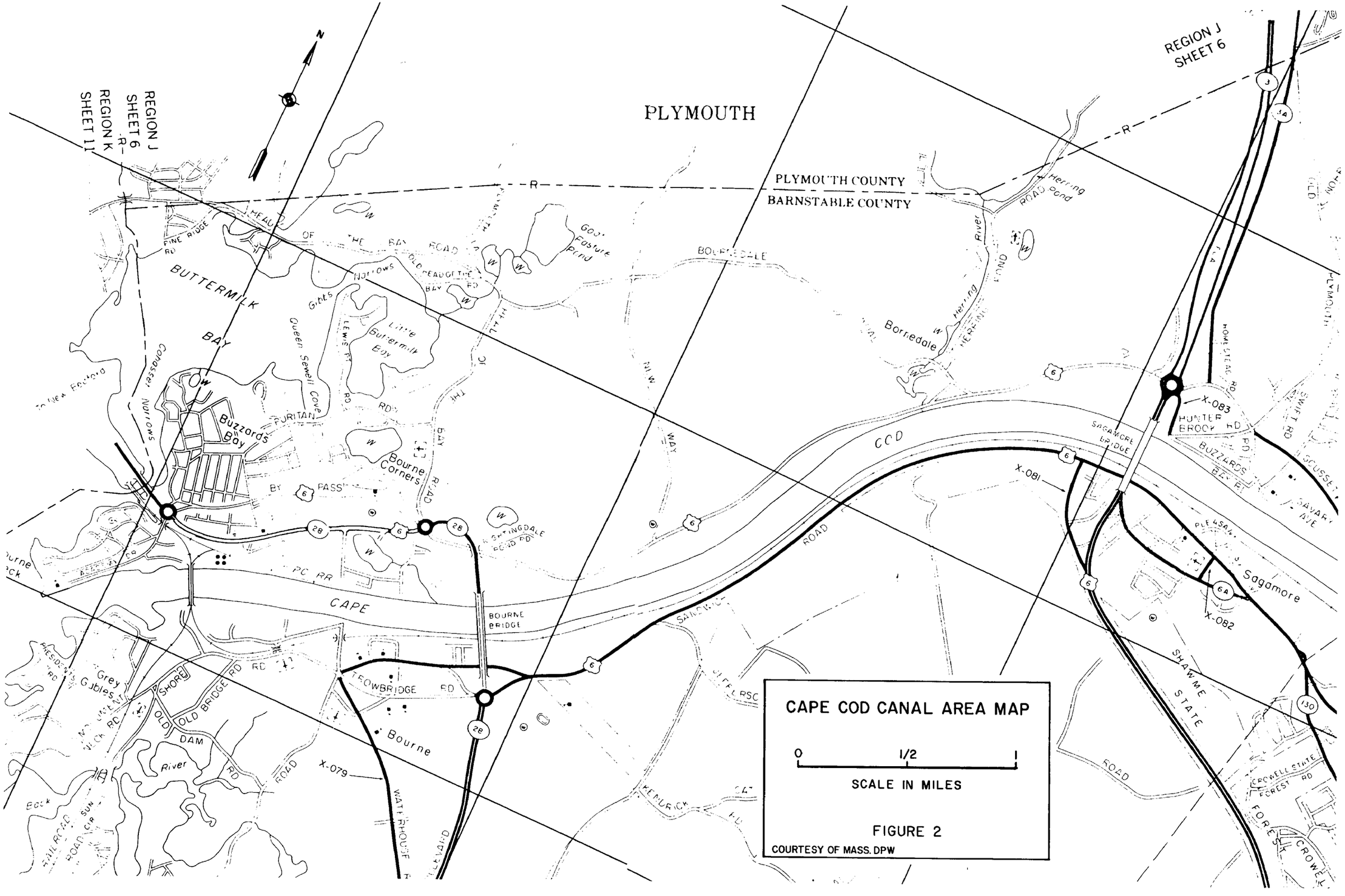

REGION J
SHEET 6
-R-
REGION K
SHEET 11
PLYMOUTH
PLYMOUTH COUNTY
BARNSTABLE COUNTY
REGION J
SHEET 6
R
N
MEADOW
OF THE BAY ROAD
OLD HEAD OF THE BAY RD
FINE RIDGE RD
BUTTERMILK BAY
NARROWS
Gibbs
Queen Sewell Cove
Little Buttermilk Bay
LEWIS FY RD
PURITAN RD
Buzzards Bay
Bourne Corners
BY PASS
6
28
W
Goss Pasture Pond
BOURNEDALE
Herring River
Herring Pond
HERRING POND
Borredale
CCD
ROAD
X-083
HUNTER BROOK RD
SAGAMORE BRIDGE
X-081
BUZZARDS BAY
SAGAMORE AVE
PLEASANT
Sagamore
6A
X-082
HOMESTEAD RD
SCUSSET
SHAWME STATE FOREST
CROWELL STATE FOREST RD
CROWELL
130
PC RR
CAPE
BOURNE BRIDGE
SPRINGDALE ROAD RD
TROWBRIDGE RD
SHORE
OLD BRIDGE RD
OLD DAM
River
RD
Bourne
X-079
WATERHOUSE
KENRICK
SANDWICH
Grey Gables
PRESIDENTS RD
RAILROAD SUN
ROAD CIR
To New Bedford
Back
CAPE COD CANAL AREA MAP
0
1/2
SCALE IN MILES
FIGURE 2
COURTESY OF MASS. DPW

TABLE I

FACT SHEET
CAPE COD CANAL HIGHWAY BRIDGES

	Bourne[1]	Sagamore
Construction Started	1933	1933
Construction Completed	1935	1935
Type of Bridge	Continuous Truss	Continuous Truss
Original Cost	$1,603,585.60	$1,364,076.21
Weight of Steel	14,467,330 lb.	10,205,590 lb.
Gallons of Paint (Original Painting)	1410	990
Number of Hanger Cables	44	44
Length of Cables	17'-10½" to 72'-6¼"	17'-10½" to 72'-6¼"
Size of Cables[2]	3¼" Dia.	3¼" Dia.
Length of Bridge	2384 Ft.	1408 Ft.
Length of Center Span	616 Ft.	616 Ft.
Length of Side Spans (2)	396 Ft.	396 Ft.
Length Approach Spans (4)	208-270 Ft.	None
Clearance Above Mean High Water (Mid Span)	144 Ft.	144 Ft.
Highest Elevation of Steel Above Mean Sea Level	274 Ft.	275 Ft.
Total Width Truss to Truss	51 Ft.	51 Ft.
Width of Roadway	40 Ft.	40 Ft.
Lane Width	10 Ft.	10 Ft.
Number of Lanes	4	4
Width of Sidewalk	6 Ft.	6 Ft.
Cost of Maintenance Since Completion	$1,886,860.00	$1,697,793.00

[1]The Bourne Highway Bridge received "First Place, Class A" in the Annual Bridge Award Competitions, American Institute of Steel Construction as "The Most Beautiful Bridge Built During 1934." (Class A includes bridges costing $1,000,000 or more)

[2]Each steel cable comprises a center wire rope of seven strands of seven wires each, wrapped in six strands of 37 wires each for a total diameter of 3¼ inches. Each cable has an ultimate strength of not less than 950,000 pounds according to the original specifications.

construction, acquisition of land, two highway bridges and one railroad lift bridge, a 3,000 foot breakwater and a 1,000 foot sand catcher at the Cape Cod Bay entrance.

1.06 Strong tides, limited channel width, and sharp bends within the completed canal resulted in numerous shipping accidents. Toll fees did not reach the anticipated levels, thus adding to the financial problems of the project, already too expensive for canal owners.

1.07 During World War I, the canal was taken over by the Federal Railroad Administration. The owners refused to take it back after the war, and after 11 years of negotiations the Federal Government purchased the canal in 1928 for $11,500,000, placed it under the supervision of the Corps of Engineers and opened it as a toll-free waterway. It was widened to 170 feet a few years later. Between 1932 and 1935 the two existing high level highway bridges and the existing vertical lift railroad bridge were built, replacing the earlier structures. By 1940 the canal had been widened to a maximum width of 540 feet with a minimum depth of 32 feet at mean low water, its present size.

1.08 The Bourne and Sagamore Bridges.

The Bourne and Sagamore highway bridges provide the only crossings of the canal for motorists, pedestrians and cyclists travelling to and from Cape Cod (and further, to and from Martha's Vineyard and Nantucket). The Bourne Bridge traverses the canal in the town of Bourne, carrying Highway Route 28. It is located approximately two miles from the western entrance to the canal. The Sagamore Bridge, approximately 3 miles to the east, also in Bourne, and two miles from the eastern entrance to the canal, carries Route 6 from Cape Cod, connecting to Route 3 on the mainland. Figures 3 and 4 are photographs of the Bourne and Sagamore Bridges, respectively.

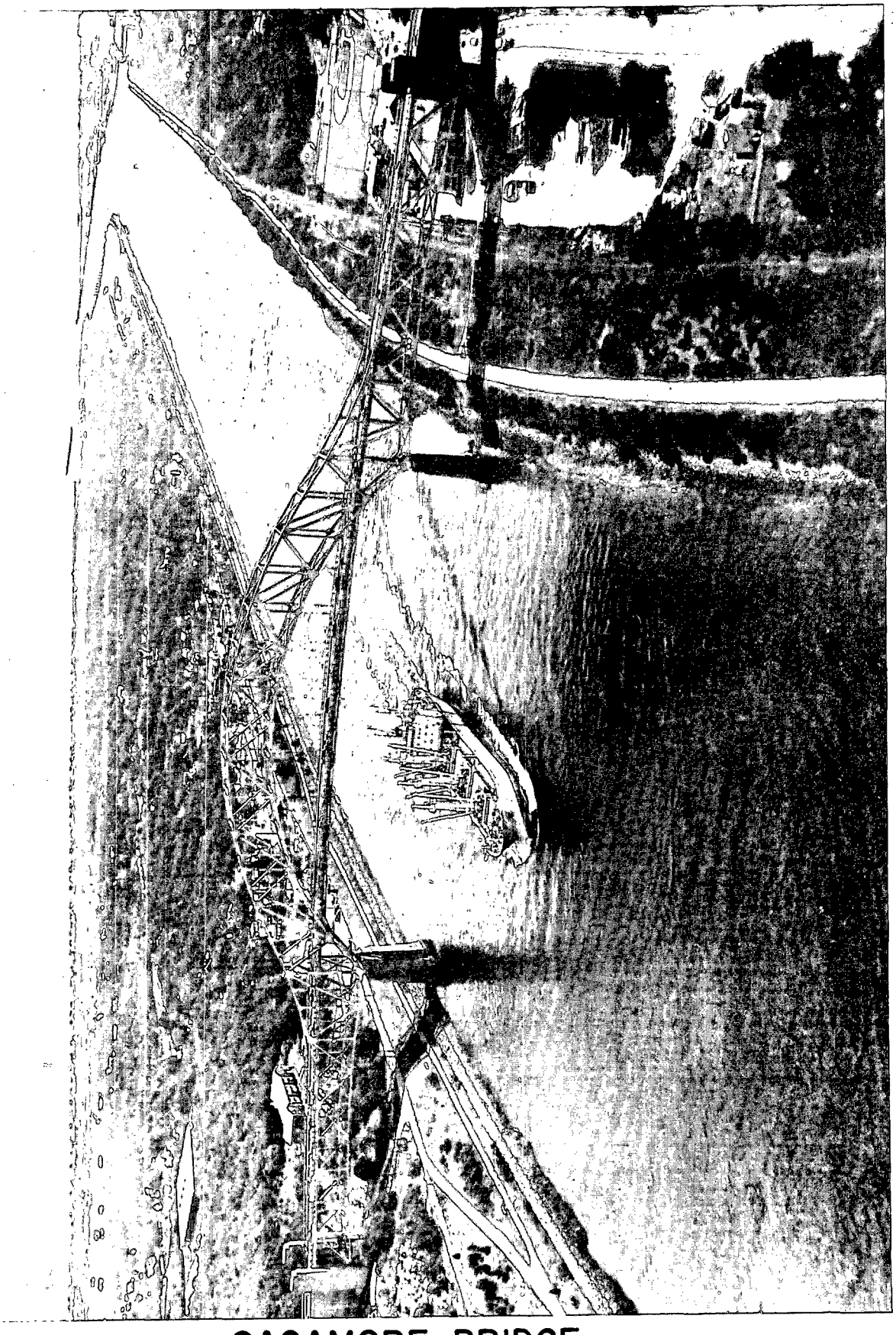
1.09 The geometric design of each bridge provides for a roadway width of 40 feet (four 10-foot wide lanes) flanked by a 6-foot wide sidewalk on one side and a 2-foot wide safety curb on the other. 16-inch high vertical granite curbing separates the roadways from the sidewalks and safety curbs. A 3-foot 9-inch high heavy duty combination traffic and pedestrian railing is located on the outsides of the safety curbs and sidewalks. Each bridge also carries telephone lines and a gas pipeline.

1.10 Project Background.

The Bourne and Sagamore Bridges were opened to traffic in 1935, which makes them 44 years old. This is not necessarily old for a bridge. One can expect a well-maintained steel structure to have a useful life of perhaps 100 years. In that light, these bridges are just reaching middle age.

BOURNE BRIDGE

FIGURE 3



SAGAMORE BRIDGE

FIGURE 4

1.11 The key word when we speak of the useful and safe life of a bridge is maintenance. That's just what this Rehabilitation Project is, part of the on-going maintenance program that started in 1935, when the bridges were completed.

1.12 Why is this work required now? For over 40 years, the bridges have been exposed to deicing salts, the effects of which have included progressive deterioration of the concrete deck and certain steel members of the bridges. It should be noted that this is not a problem unique to the Cape Cod Canal Bridges, but rather is quite common among highway bridges in New England. It is compounded by the fact that the bridges are located near salt water. Today the Bourne and Sagamore Bridges are totally safe for public travel. The completion of this project will insure the continuation of that safety into the future.

1.13 The history of the maintenance program of the bridges dates back to when they were completed. It includes periodic painting on the average of every 5-7 years and occasional resurfacing of the roadway.

1.14 The first major repairs were performed in 1962 on the Sagamore Bridge, and included the removal and replacement of the outside 5 feet of roadway deck because of deterioration due to road salts, as well as the waterproofing and resurfacing of the entire deck. At that time, the bridge was closed for a short period in order to complete some of the work. Similar work was performed in 1963 on the Bourne Bridge.

1.15 The maintenance program has included periodic inspections by the Corps of Engineers. In 1969 and 1971, inspections were made by the firm of Fay, Spofford & Thorndike, the original designers of the bridges. Based on their reports, repairs were made on the Sagamore Bridge in 1974.

1.16 In 1975, the Corps of Engineers entered into an agreement with the New York engineering firm of Ammann and Whitney for an in-depth inspection, evaluation and condition report on the bridges. From August 1975 through June 1976 three teams of bridge inspectors covered literally every inch of the bridges, taking photographs and making field sketches and notes. In addition to the field investigation, they also performed a computer evaluation of the existing bridge structures using current design criteria. When their work was completed, the Corps of Engineers received an 11 volume report on the two bridges itemizing individual repair items from as small as a single rivet to as large as the entire bridge decks.

1.17 Based on this report, the New England Division, Corps of Engineers prepared and submitted separate Reconnaissance Reports to the Office of the Chief of Engineers, on 3 August 1977 for the Sagamore Bridge and on 31 August 1977 for the Bourne Bridge.

1.18 Project Description.

The major item of work will be replacement of the concrete decks which form the roadways for the bridges. Other work will consist of repairs to structural steel and repainting of both of the superstructures. Also, 8-foot high suicide-deterring barriers will be erected atop the railings on the bridges to discourage suicide attempts. During good weather periods, the work will be accomplished in two daily eight-hour shifts.

1.19 The total estimated construction cost of the project is $12,600,000. It is anticipated that a construction contract would be awarded during June 1979.

1.20 Work is scheduled to begin on the Bourne Bridge shortly after award of the construction contract; however no activities that would interfere with the flow of traffic would be permitted until after Labor Day. After Labor Day, one of the four traffic lanes would remain open on the Bourne Bridge for general traffic and all four lanes of the Sagamore Bridge would be completely open. The one open lane of the Bourne Bridge would be reversed on weekdays to handle the morning and afternoon directional peaks in traffic flows, with a similar plan to be implemented on weekends. Arrangements would be made to clear the bridge of traffic to allow passage of emergency and other authorized vehicles. Trucks in excess of one-ton capacity would be excluded from the single open lane at all times and detoured to the fully open Sagamore Bridge. Pedestrians and bicycles would also be excluded from the bridge while it is under construction. It is expected that it would take approximately two years to complete work at the Bourne Bridge with three of the four lanes being closed during the fall, winter and spring of 1979-80 and the fall, winter and spring of 1980-81. The bridge would be fully opened to all users during the period from just before the Memorial Day Weekend to just after Labor Day of each construction year. With completion of work at the Bourne Bridge in the spring of 1981, work would start at the Sagamore Bridge in the fall of that year and be completed in the spring of 1983. Traffic patterns similar to those outlined for the Bourne Bridge are planned for the Sagamore Bridge repair period.

2.00 ENVIRONMENTAL SETTING WITHOUT THE PROJECT

Since the prime concern relating to this project is one of socioeconomic effects, specifically those resulting from altered traffic patterns during construction, this Supplemental Environmental Impact Statement will concern itself primarily with socioeconomic matters, particularly of a transportation-related nature. The reader is referred to the April 1977 Final Environmental Statement for the Cape Cod Canal for background material concerning topography and geology of the area, hydrography, climate, water and air quality and aquatic flora and fauna. The two sections to follow provide a background for later discussions of the socioeconomic impacts resulting from the bridge rehabilitation work and of the measures planned for the mitigation of these effects.

2.01 Socioeconomic Profile.

2.02 Population. The population of Bourne has grown at a rapid rate far in excess of the populations of Massachusetts, New England, or the United States. Between 1950 and 1970, the town increased in population from 4,720 to 12,636 or 168% in 20 years. The rapid growth trend witnessed in Bourne is also evident in Barnstable County, which encompasses all of Cape Cod, and includes the portions of Bourne and Sandwich on the mainland. Between 1950 and 1970, the population of Barnstable County increased by 107%, from 46,805 to 96,656. During the same 20 year period, the Massachusetts population increased by only 21%.

2.03 Population projections for both Bourne and Barnstable County estimated by the Cape Cod Planning and Economic Development Commission indicate that further increases can be expected throughout the remainder of this century with the rate of increase peaking around 1985, then falling off significantly.

2.04 In addition to the resident population, significant seasonal increases occur consistent with the popularity of the region as a summer resort area. Population in Bourne and Barnstable County begins to grow gradually in April, peaks in July and August, and declines to its year-round level in early November. In 1976 the peak seasonal population in Bourne increased to 2.9 times the year-round population. The average growth multiple for Barnstable County overall was 3.0.

2.05 Another characteristic of the population of Bourne and Barnstable County is the increasing percentage of residents 65 years of age and over. Between 1960 and 1970, Bourne's 65 and over population grew from 782 to 1,142, an increase of 46.0%. This compares to a 5.6% increase statewide for the same age category. For Barnstable County as a whole, the 1960 to 1970 increase was 82.5% with the 16,348 County residents in this age bracket in 1970 accounting for 16.9% of the total population, compared to 11.1% statewide.

2.06 Economic Structure. The economies of the town of Bourne and Barnstable County share a common characteristic: they are both primarily tourist-dependent with a seasonal peak in activity during July and August. Those employment sectors most directly related to tourism - wholesale and retail trade (including food and clothing stores, department, chain and discount stores, novelty shops, antique shops, gift shops, gas stations, and sales outlets for recreational equipment) and services (including motels, hotels, restaurants, health care institutions, recreational and entertainment facilities, fire and police departments, and all trades) - are the largest and second largest employers in both the town and the County.

2.07 Between 1970 and 1976, total annual average employment in Bourne rose from 1,511 to 2,217, an increase of 47%. Contributing to that total increase was a combined growth in the wholesale and retail trade sector and the service sector of 45%. Over the same time period, total annual average employment in Barnstable County increased by 48%, due largely to a combined growth in wholesale and retail trade and the service sector of 64%.

2.08 The dependence of Cape Cod's economy on these tourism-related employment sectors is further illustrated by the fact that they combine to provide 61% of all employment offerings in the town of Bourne and 72% in Barnstable County. These figures compare to a corresponding share of employment for the State of Massachusetts of only 45%.

2.09 Seasonal differences in employment levels are dramatic. In 1976 the seasonal lowpoint for employment in Bourne was in January, and the highpoint in August, with an increase of 43%; wholesale and retail trade experienced an increase of 63% from January to August; in the service sector, employment grew 44% from a February lull to a July peak.

2.10 Seasonal fluctuations are even more dramatic when witnessed at the County level, with a 62% growth in total employment from the February low to the July peak in 1976. Employment in wholesale and retail trade reached a lowpoint in February and increased by 82% at the August peak. In the service sector, a 72% increase occurred between the January low and the August high.

2.11 Unemployment is a major problem facing the local labor forces in both Bourne and Barnstable County. In 1978, an average of 8.8% of the 6,495 workers that comprise the town's labor force was unemployed, as was 9.2% of the total County labor force of 61,808. This was in comparison to the statewide 1978 unemployment rate of 6.0%. The seasonally fluctuating local and regional economies intensify the problem causing unemployment to soar during the off-season for tourism. The seasonal highpoint for unemployment in 1978 occurred in January for both

the town and the County, at a rate of 14.7% in Bourne and 15.3% in Barnstable County, compared to a substantially lower statewide high of only 7.5%, also recorded in January.

2.12 Transportation. All automobile, truck and bus traffic to and from Cape Cod, as well as Martha's Vineyard and Nantucket, must pass over either the Bourne or the Sagamore Bridge. The Bourne Bridge carries Route 28 onto the mainland, where Routes 28 and 6 lead traffic into the rest of southeastern Massachusetts. Route 28 through Buzzards Bay is a particularly severe bottleneck during heavy traffic periods. An extension of Route 25 to the Bourne Bridge is planned by the State, to eliminate this problem. Construction is expected to begin in 1979. The Sagamore Bridge connects Route 6, which extends from the canal area to Provincetown, with Route 3, linking Barnstable County with Metropolitan Boston and several South Shore communities. Separate arms of Route 6 link the two bridges on the northern and southern sides of the canal.

2.13 The bridges carry nearly all deliveries of food and other products and materials to Cape Cod and the Islands, from the mainland. They serve as vital arteries for police, fire and other emergency vehicles, particularly for the towns of Bourne and Sandwich, both of which are physically divided by the canal. And they serve to channel traffic to and from the Cape and the Islands, including everyday local traffic travelling short distances, commuter traffic travelling to places of employment on either side of the canal (and at distances as far away as Boston) as well as the massive amounts associated with this area's summer tourist and summer resident seasons.

2.14 Free-flow of traffic is of particular importance to emergency vehicles and to year-round residents of the area. Sandwich's police and fire vehicles must cross the Sagamore Bridge from the Cape side to reach the portion of town north of the canal. Bourne's emergency vehicles utilize the bridges extensively. The primary facilities are located north of the canal. State Police barracks are located just south of the Bourne Bridge, from where they serve the nearby parts of both the Cape and the mainland. Depending on the exact location and nature of a medical emergency ambulances may need to cross one or the other of the bridges either enroute to the emergency or to one of the hospitals on the Cape or the mainland.

2.15 Use of the bridges by local residents is significant. Since 7,037 or 62% of all Bourne residents live on the southern side of the canal, and most of the shopping centers, indoor recreational facilities, places of worship, health care facilities and the Town Hall are located on the northern side, many of the residents must cross one of the bridges frequently. Portions of the population on the mainland side regularly cross over to reach schools and the outdoor recreational facilities concentrated on the south side of the canal. In addition

Bourne's sanitary landfill is to the south of the Bourne Bridge, serving areas on both sides. The Bourne Department of Public Works is also located to the south of the canal.

2.16 As a link for commuter traffic, the bridges serve several thousand of the local residents each day. The 2,118 Barnstable County residents listed by the 1970 U.S. Census as employed outside the County limits could be considered a minimum number of daily commuters for employment because of the significant increase in population since the figures were compiled.

2.17 At the present time, a commuter parking lot with spaces for 215 vehicles is located on the mainland side of the Sagamore Bridge at the junction of Routes 6 and 3. Filled to capacity almost daily, this parking area is served by buses travelling to and from Boston. This arrangement does little, however, to alleviate traffic congestion at the bridge because Cape Cod residents must still cross over to reach the park-and-ride facilities.

2.18 A similar commuter parking area is located at the junction of Routes 6 and 132 in Barnstable, to serve the needs of outer-Cape residents. Its 210 spaces are filled almost daily, and local transportation planners believe that the actual demand greatly exceeds the available spaces.

2.19 Rail travel to and from Barnstable County is currently not very extensive and is limited to freight service. The existing facilities, including the single track crossing of the canal, are adequate to transport a much larger volume of cargo than is presently being carried.

2.20 Plans for initiation of passenger service between New York and Cape Cod by as early as 1979 are being implemented by Amtrak. The project includes the renovation of 35 miles of old track extending through Sandwich, Falmouth and Hyannis. Further proposed railbed restorations may make service between Boston and Cape Cod possible by as early as the early 1980's. Passenger service to and from the Cape may have profound implications for the future alleviation of the enormous peak season traffic pressures upon the highways in the area and the bridges over the canal.

2.21 Traffic Pressures at the Bridges.

During the tourist industry's off-season, September through May, the highway system, including the bridges, is considered adequate to meet the transportation needs of the year-round population. During the summer vacation months, however, traffic congestion in the vicinity of the two bridges becomes a serious transportation problem, particularly at peak daily hours and on weekends.

2.22 Traffic surveys conducted by the Massachusetts Department of Public Works (DPW) in 1977 confirm that the peak months for both bridges are July and August. The DPW has estimated an approximate peak hour directional split of the traffic crossing the bridges as 70% - 30%. At the recorded seasonal peak in 1977, on July 16, 35,170 vehicles passed over the Bourne Bridge and 62,230 over the Sagamore, for a combined total of 97,400 vehicles. The heaviest hour during this day was from 10 a.m. to 11 a.m., when 2,490 vehicles passed over the Bourne Bridge and 5,030 crossed the Sagamore. Applying the 70% - 30% split, this means 1,743 vehicles crossed the Bourne and 3,521 crossed the Sagamore in the direction of greatest traffic pressure, obviously toward the Cape on this particular Saturday morning. The DPW-estimated capacity of two lanes over either bridge is 2,500 vehicles per hour. Thus, during this peak hour, traffic on the Bourne was within capacity. Traffic on the Sagamore exceeded capacity by 1,021, thus resulting in a major bottleneck. Of this excess, 757 vehicles could have been absorbed by the Bourne Bridge as an alternate route, however this still would have left 264 vehicles in excess of the two bridges' combined capacity. With similar peaks recorded through the rest of July and August, it is apparent that these are not the months for bridge construction and associated lane closings.

2.23 On the other hand, the heaviest recorded traffic flow during the after-Labor Day through pre-Memorial Day off-season in 1977 occurred on May 22, a Sunday, with 28,770 vehicles crossing the Bourne Bridge and 45,320 passing over the Sagamore, for a combined total of 74,090 vehicles. During the peak hour from 3 p.m. to 4 p.m., 2,590 vehicles crossed over the Bourne Bridge and 3,470 over the Sagamore. Applying the 70% - 30% directional split, this calculates to 1,813 over the Bourne and 2,429 over the Sagamore travelling toward the mainland during this afternoon peak hour. Thus, neither bridge reached capacity flow during this heaviest recorded traffic hour of the off-season.

2.24 During most of the off-season period the bridges function at a level well below their capacities, even during the commuter rush hours.

2.25 Threatened and Endangered Species.

There is no evidence that any threatened or endangered plants or animals, either terrestrial or aquatic, inhabit the project area or will be affected in any way by the project activities.

2.26 Historical-Archaeological Features.

A review of potential impacts on cultural resources, mandated by the Nationl Historic Preservation Act of 1966 (P.L. 89-665) and Executive Order 11593, has been undertaken. As the proposed repairs will result in negligible change to the appearance of the bridge

superstructures and will not involve ground disturbance, impacts to significant cultural resources are unlikely. Coordination with the Massachusetts Historical Commisssion has resulted in a determination of "no effect" upon significant cultural resources as a result of project implementation. The pertinent correspondence may be found in Appendix A to this Supplemental Impact Statement.

3.00 RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

The proposed project does not conflict with existing or proposed Federal, State or local land use plans. Project implementation will insure the continued use of the bridges for their intended purpose of transporting traffic across the Cape Cod Canal to and from points on Cape Cod and the mainland.

4.00 PROBABLE IMPACTS OF THE PROPOSED ACTION ON THE ENVIRONMENT

The proposed action will ensure the continued safe use of the bridges into the future and eliminate the adverse impacts associated with frequent repair work. The suicide-deterring fencing to be erected atop the bridge railings (see Sections 1.18 and 4.19) should help reduce the incidence of suicides from the bridges. The primary adverse impacts concern the effects on traffic flow when either bridge is being rehabilitated. Traffic of various types will be affected, including routine local commercial and noncommercial vehicles, emergency vehicles as well as general traffic of all kinds, especially that relating to seasonal use of the Cape and the Islands. Some economic effects may be expected as a result of the traffic impacts. Other, minor impacts will be related to the construction work itself.

4.01 Impacts on Traffic.

In early discussions with local officials and with the Massachusetts Department of Public Works it became obvious that we could not completely close a bridge to work on it. Since three lanes must be shut down on a bridge under construction for the work to proceed efficiently, it was also clear that work could not proceed on both bridges at the same time. We therefore decided to rehabilitate the two bridges separately, in time, and were then left to consider the most efficient use of one fully open bridge plus a single open lane on the bridge under construction.

4.02 We have decided to retain the 2-lane-in-each-direction traffic pattern on the open bridge, primarily because interference with the normal traffic pattern on the already-narrow lanes would likely promote more harm than good.

4.03 We considered reserving the single open lane on the bridge under construction for emergency and other authorized vehicles only; however, this appeared to be unnecessarily restrictive. We have decided, instead, to keep the one open lane available to routine traffic, in the direction of greatest traffic pressure, on a schedule to be determined in advance. This lane would be under police control to allow emergency and other authorized vehicles necessary access to the lane, in either direction.

4.04 Traffic approaching the bridge in the direction opposite to the one open lane would be rerouted to the other bridge. Traffic heading in the same direction as the one open lane would be advised of the potential advantage of using the other bridge as an alternate. This should cause redistribution of a large enough portion of the traffic during heavy flow periods to alleviate pressure on this lane. In

addition, trucks in excess of one-ton capacity would be excluded from the single open lane at all times and detoured to the fully open bridge.

4.05 It should be re-emphasized that both bridges will be fully open from just before the Memorial Day Weekend to just after Labor Day of each construction year, the time of greatest traffic demand upon the bridges. No activities that would interfere with the full flow of traffic at the normal capacity of the bridges would be permitted during this more than three-month interval.

4.06 During the peak hours of the part of the construction season shortly before and after the Memorial Day to Labor Day period, traffic demand on the bridges may still be heavy enough so that backups may occur in the heavier-trafficked direction.

4.07 Throughout most of the construction season, however, this will not be the case, and the three traffic lanes in the direction of greatest demand will be more than adequate.

4.08 Effects of Impacts on Traffic. The provision of three lanes of traffic flow in the direction of heaviest traffic during the September-May construction period should be adequate to satisfy the traffic demands normally experienced, with the exception of possible congestion problems during peak hours in September and May. Heavy traffic during these two months would probably result in the inconvenience of increased travel time, but the duration of the traffic problem would not be long enough to cause any sustained economic harm. Traffic conditions during peak hours in May and September would probably be similar to those normally experienced during peak hours of July and August with both bridges completely functional.

4.09 The effects of the single directional lane on those desiring to travel in the opposite direction will be primarily inconvenience and some economic hardship, of greatest magnitude to those needing to do so frequently or regularly. The detour using the other bridge amounts to approximately 7 miles. Certain regular users, such as school buses, may be authorized as vehicles eligible for temporary stopping of traffic, and lane reversal. 24-hour radio-equipped police control of the single lane will avoid potential problems associated with access and use by emergency and other authorized vehicles.

4.10 Coordination with Construction of Route 25. Construction on the planned extension of Route 25 from Wareham to the Bourne Bridge is of concern to the Bridges Rehabilitation Project insofar as it relates to the planned new tie-in for Route 25 as well as Routes 6 and 28 at the northern terminus of the Bourne Bridge. The Corps of Engineers and the Massachusetts Department of Public Works have been in close contact concerning appropriate coordination of the schedules for these two

projects. Ideally, the tie-in construction at the Bourne Bridge would take place concurrently with the rehabilitation of the bridge itself. This would yield a twofold advantage. First, it would concentrate all construction work at that location into the same time frame, rather than subjecting the area to an extended period of construction activity. Second, it would permit full use of the rehabilitated Bourne Bridge and the completed tie-in, during the rehabilitation of the Sagamore Bridge.

4.11 The Route 25 project will be accomplished in two stages: Wareham to Plymouth and Plymouth to the Bourne Bridge. Construction on the Wareham to Plymouth portion is expected to commence in 1979. The Plymouth to the Bourne Bridge Section construction is expected to begin in the spring of 1980. The new tie-in at the Bourne Bridge is planned for completion by the fall of 1981, in time for its use when rehabilitation work begins at the Sagamore Bridge in September of that year.

4.12 Pedestrian and Bicycle Access to the Bridges. Pedestrians and bicycles, normally users of the bridges' sidewalks (one sidewalk is available on each bridge), will not be allowed on a bridge under repair for safety reasons. No modifications to the bridges or the approaches to the bridges are anticipated which will in any way affect pedestrian or bicycle access and use after rehabilitation. The Department of Public Works has indicated that it will make provisions to bring bicycles up to the Bourne Bridge as part of the Route 25 tie-in construction.

4.13 Increased bicycle use may be anticipated with the inclusion of the Sagamore Bridge as part of the Boston to Cape Cod Bikeway. Consideration was given to performing modifications to include bicycle lanes on the outsides of the bridges, however this was determined to be structurally infeasible. Widening of the sidewalks was also considered, but rejected because such action would reduce the already substandard 10-foot wide traffic lanes. The Corps will continue to explore possible measures for enhancement of the safety and enjoyment of the bridges and their accesses for cyclists in coordination with local and regional cycling interests.

4.14 Falling Materials.

Pieces of decking will be prevented from falling from the bridges by the installation of boarding below the bridges during the removal process. All efforts will be made to see that no other construction materials fall from the bridges.

4.15 Some impact may be expected as a result of the removal of about ten percent of the old paint systems and the entire repainting of the bridge superstructures. Much of the old paint, sand used in sandblasting and small amounts of the new paint will fall from the bridges into the canal and onto immediately adjacent land areas. Although shrouding could be set up to collect these materials, the shrouding would cause an unacceptable hazard to the workers. Wind stress would provide the greatest danger.

4.16 Because of the expected falling of paint material and sand and the likelihood that despite all precautions on the bridges, some construction material will fall to the ground/canal level, it is planned to close the appropriate portions of the Bourne Scenic Park, as well as Corps recreational facilities beneath the two bridges at such times as any work is proceeding on the bridges above or nearby to them. Vessel traffic entering the canal will be warned of the construction activity ahead. Streets and highways passing under the bridges will be appropriately posted.

4.17 It is possible that aesthetically unpleasing amounts of old and new paint and sand may accumulate on land areas beneath the bridges. In the canal the paint material and sand should be dispersed by the tides. Amounts of falling paint and sand should be small enough to cause no significant effect on the local ecology, either terrestrial or aquatic.

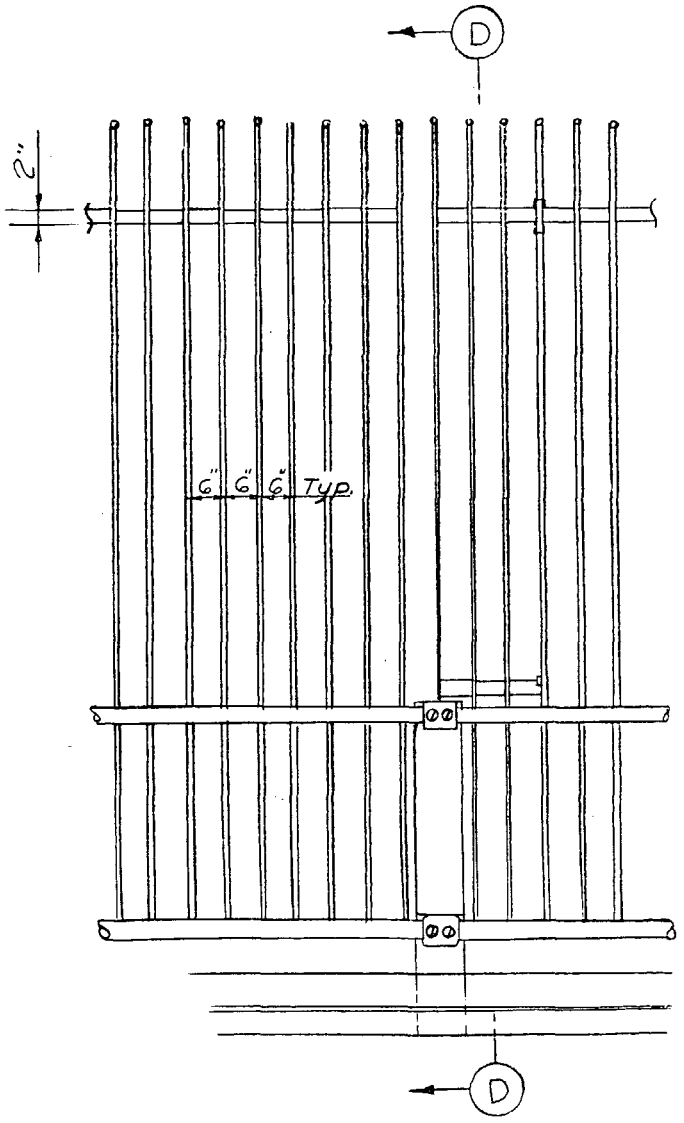
4.18 Other Impacts.

Additional impacts comprise noise pollution due to the construction work itself plus some addition to the local traffic load resulting from the transport of materials and workers to and from the construction sites.

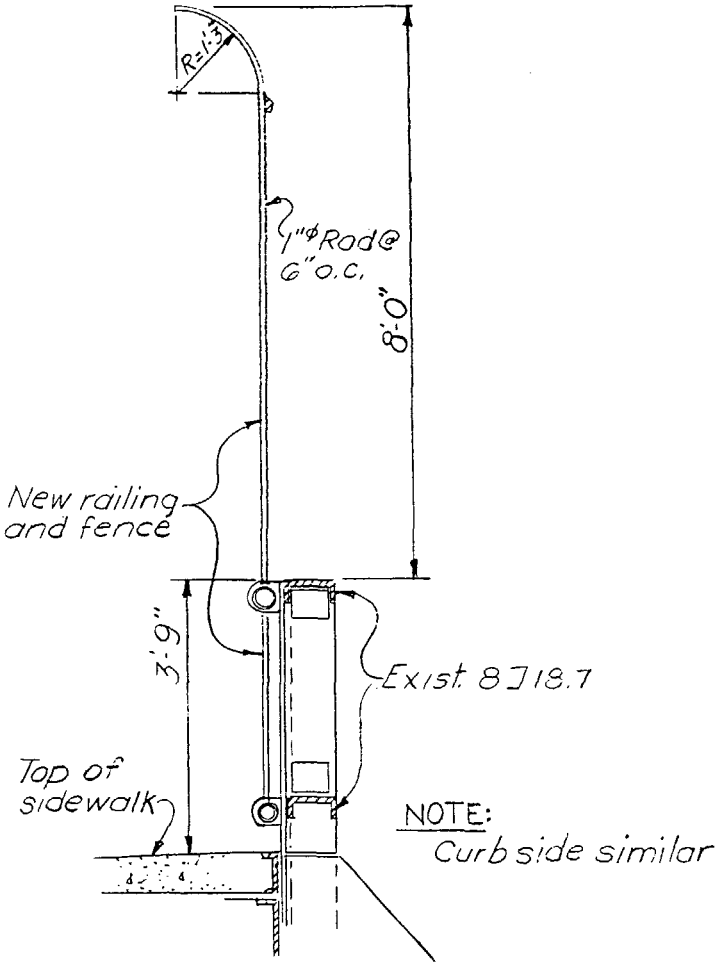
4.19 Suicide-deterring Fences.

The existing railings at the sides of the bridges are less than 4 feet high and do not discourage suicide attempts. According to Ms. Monica Stratton of the Samaritans, a suicide prevention service on the Cape, the bridges are a definite target for potential suicides. In 1977, nine persons took their lives at the bridges and an equal number of attempts were averted.

4.20 As part of this project, the Corps plans to install 8-foot high barriers atop the railings on both sides of each bridge to deter suicide attempts. These barriers will be curved inward at the top, with 6 inches of space between vertical members (see Figure 5).



ELEVATION



SECTION D-D

PROPOSED SUICIDE-DETERRING FENCE

SCALE 1/2"=1'-0"

FIGURE 5

4.21 Nevertheless, it seems that no matter how high you put something up, if someone really wants to get over it, they undoubtedly will. The idea behind a suicide deterring barrier is not so much to prevent it from being traversed, but rather to slow down a person enough so that the situation can be recognized and help can get to them.

5.00 PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

The prime adverse environmental effect is upon traffic flows at the bridges.

5.01 Some economic hardship may be borne by frequent or regular users of the bridges as a result of the traffic impacts.

5.02 Paint and sand falling from the bridges will cause local nuisance effects to land areas beneath them and to vessel traffic in the canal.

5.03 Noise pollution due to the construction work itself, plus some addition to the local traffic load as a result of the transport of materials and workers to and from the construction sites may also be anticipated.

6.00 ALTERNATIVES TO THE PROPOSED ACTION

6.01 No Action.

The no-action alternative would avoid the impacts listed in the earlier sections and would save the immediate expenditure of $12,600,000 required for bridge rehabilitation.

6.02 Eventually, the bridges would deteriorate in condition to the point where they would be unrepairable. Rehabilitation is imperative so that the bridges will remain a useful part of the existing canal project and continue to maintain a means of vehicular access to and from Cape Cod and the Islands.

6.03 Implementation Alternatives.

During the planning for this project options were evaluated concerning the exact extent of the rehabilitations, selection of materials, establishment of time schedules and mitigation of traffic problems.

6.04 Degree of deterioration and anticipated further useful life of existing bridge components determined the extent of the rehabilitations required. Engineering judgments determined the selection of the materials to be used.

6.05 Alternatives were considered concerning how much, if any, of the peak traffic season should be excluded from the traffic-restricting construction schedule. Severe travel disruptions and profound economic and social impacts would result during the months most important to the area economy if construction were to be allowed to continue through the summer. July and August constitute the peak of this period. June is rapidly increasing in importance. Thus the just after Labor Day through just before Memorial Day Weekend construction season was selected.

6.06 Several alternatives were also considered during development of the traffic mitigation plans, other than the obvious and already-discussed alternative uses of the available capacity of the bridges themselves. The possible alteration of the railroad bridge to handle vehicular traffic was investigated. However, substantial modification would be needed to provide a roadbed for traffic adding appreciable weight which the existing machinery and supports are not designed to accommodate. In terms of use-feasibility, when it would be in position for traffic use, this lift bridge would exclude normal use by vessels in the canal, severely disrupting the canal operation. Establishment and use of a floating bridge or bridges in the canal was also considered,

however the swift tidal flow through the canal would render such structures unstable in position. Furthermore, no movement of vessel traffic in the canal would be possible with any such bridge in place.

7.00 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Rehabilitation of the canal bridges is vital in terms of their continued safe use into the future.

7.01 This project will serve to enhance the long-term productivity of the area, by ensuring the continued ability of the bridges to perform their function an estimated 40 more years with normal maintenance.

7.02 The short-term adverse effects described in this Supplemental Impact Statement are necessary to the work that will allow the long-term benefits to be realized.

8.00 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED PROJECT SHOULD IT BE IMPLEMENTED

The labor, fuel and financial resources which would be expended if the proposed project were implemented are irretrievable.

9.00 COORDINATION

Throughout the progress of this study, coordination and liaison have been maintained between the Corps and interested local, regional, State and Federal agencies and the public.

9.01 Right from the beginning, we have been in close contact with representatives of the Massachuusetts Department of Public Works - from a traffic control standpoint, as well as to coordinate the projected bridge rehabilitations with the anticipated construction of the tie-in of Route 25 at the Bourne Bridge.

9.02 In the spring of 1978 initial meetings were held with the Selectmen and Police and Fire Chiefs from the towns of Bourne and Sandwich and with the Executive Director of the Cape Cod Planning and Economic Development Commission.

9.03 As a result of the early contacts and meetings, a number of our original ideas concerning mitigation of the expected effects, especially with regard to traffic, were revised.

9.04 On July 26, 1978, a widely publicized Public Information Workshop was held at the Bourne Memorial Community Building to further foster public communication and involvement.

9.05 This Draft Supplemental Environmental Impact Statement is yet another step in the public involvement process. It will be available for review and comment by local, regional, State and Federal agencies and other interests for a period of 45 days after announcement of its issuance in the Federal Register.

9.06 Based upon the comments received, a Final Supplemental Environmental Impact Statement will be prepared and issued in May of 1979.

9.07 In the late spring or early summer, another Public Information Workshop will be held, to answer specific questions concerning the upcoming work.

9.08 During the summer and beyond, the Corps will continue to coordinate closely with all interests to implement the plans that have been developed to minimize the adverse effects of this project. The plans, and any changes, as needed will be widely advertised and reported through the media.

APPENDIX A

CORRESPONDENCE

PAUL GUZZI
Secretary of the Commonwealth

The Commonwealth of Massachusetts
Office of the Secretary
Massachusetts Historical Commission
294 Washington Street Boston, Massachusetts 02108
(617) 727-8470

April 26, 1978

Mr. Joseph L. Ignazio
Chief, Planning Division
Department of the Army
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Re: Cape Cod Canal Bridges

Dear Chief Ignazio:

The Massachusetts Historical Commission (MHC) has reviewed the proposed rehabilitation project to the Cape Cod Canal Bridges. MHC feels that the project will have no effect on significant cultural resources.

If MHC can be of further assistance, please contact Valerie Talmage, Staff Archaeologist.

Sincerely,

Patricia L. Weslowski

Patricia L. Weslowski
Acting Executive Director
Massachusetts Historical Commission
State Historic Preservation Officer

PLW/VAT/pg

TOWN OF SANDWICH

THE OLDEST TOWN ON CAPE COD

SANDWICH, MASSACHUSETTS

TELEPHONE 888-0157

OFFICE OF THE:
BOARD OF SELECTMEN
BOARD OF ASSESSORS

June 15, 1978

Colonel John Chandler, Division Engineer
New England Division
U.S. Army Corps. of Engineers
424 Trapelo Road
Waltham, MA 02154

Dear Sir,

This letter is in reference to a meeting held between Mr. Robert Harrington, Mr. Joseph Horowitz and the Town of Sandwich concerning the Cape Cod bridge rehabilitation project.

We thank you very much for the efforts of your office in bringing the plan to us before public notice has been given. It is nice to know what the problem is before the questions are asked.

The following are our areas of concern:

1. Movement of Emergency Vehicles. The single lane operation should handle emergencies if the Bourne police, who we assume will be on duty, are equipped with portable radios. The frequency used by both departments is shared. The greatest problem we anticipate is when the emergency vehicles are going with the flow of traffic. For this problem we request that an emergency only lane be established so that these vehicles can by-pass the anticipated back up.

2. Movement of School Buses. The Town of Sandwich has their schools only on the south side of the Cape Cod Canal. Unfortunately, we have children on the north side. At the present time we have a Jr.-Sr. High School bus twice a day, an elementary school bus twice a day, and a kindergarten car once a day. The system of allowable travel, i.e., one-way traffic, will result in the buses being forced to take the long way around when they have the students on board. We request that these vehicles be granted permission, at least on a trial basis, to go against traffic. Inability to do so will have adverse affects on our school and our students.

3. Commuter Traffic. Although this problem is composed of two parts, automobiles and buses, we feel that the best solution might solve both. First of all, it is very necessary that buses be allowed to use the single lane but only in the allowable direction. The bus terminal provided by Mass. DPW at the Sagamore rotary has become a very important commuter

center. This area should remain to service those persons who live on the north side of Cape Cod. We recommend that, if it is at all possible, a temporary parking lot and bus stop be established on the south side of the canal. This proposal will reduce greatly the volume of traffic crossing the bridges. We cannot recommend a location for this facility, but we would be glad to help if this course of action is adopted.

Thank you for your consideration in these matters.

Very truly yours,

BOARD OF SELECTMEN

H. Eugene Carr

HEC/jb